NUTRIENT AND ENERGY DIGESTIBILITY, AND NITROGEN RETENTION IN ARCTIC FOXES FED ANIMAL MEALS

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Introduction

Nutrient digestibility is related to a variety of biological and environmental factors. Due to the wide diversity of these factors and their interactions, the problem of nutrient assimilability in carnivorous fur-bearing animals has been the subject of numerous researches (Gugołek et al. 1997, Lorek et al. 1991, Lorek et al. 1994a , Lorek et al. 1994b) and still requires further investigations.

The objective of the present study was to determine the levels of nutrient digestibility and nitrogen retention in growing Arctic foxes fed a diet composed of animal meal, extruded ground grain and water, as compared with these parameters in animals fed a traditional diet.

Material and Methods

The experiment was performed on eight female blue foxes aged four months, selected of two litters and allocated to two groups by the analogue method. The experimental factor was differentiated feeding. The foxes of group I (control) were fed a diet composed of poultry confiscates, soft poultry offal, extruded ground wheat and water. The foxes of group II (experimental) were fed a diet composed of meat-bone meal, extruded ground wheat and water. Meat-bone meal contained 93.73% dry matter, 24.79% crude ash, 68.94% organic matter, 43.93% crude protein, 16.56% crude fat, 2.93% crude fiber and 5.52% N-free extractives. Gross energy content was 12.720 MJ/kg. The percentage chemical composition of the diet for group I was as follows: dry matter – 34.82, crude ash – 2.22, organic matter – 32.60, crude protein – 13.57, crude fat – 7.50, crude fiber – 1.08, N-free extractives – 10.45. In group II these values were 56.43, 9.52, 46.91, 15.38, 6.78, 1.96 and 22.79% respectively. The diet for group I contained 7.895 MJ/kg and that for group II – 10.594 MJ/kg.

The animals were placed in cages adapted for quantitative collection of feces and urine samples. A five-day proper experimental period was preceded by a four-day preliminary period. The animals were fed once a day; feed amount was 600 g/animal in group I, and 500 g/animal in group II. Feces were frozen, and two average samples were collected at the end of the experimental period. Protein content was determined in the first sample, and the other sample was partly dried to determine the concentrations of the remaining nutrients. Urine samples were preserved in 20% sulfuric acid, and its amount was measured after the completion of the experiment. The nutrient content of feed and feces, and urinary nitrogen content, were determined by the Weende method (Skulmowski 1974). Nutrient digestibility and nitrogen retention were calcu-

lated by the balance method commonly applied in digestibility experiments (Gugołek et al. 1997, Lorek et al. 1991, Lorek et al. 1994a, Lorek et al. 1994b). The numerical material was analyzed statistically using an analysis of variance in one-factor orthogonal designs (Statistica PL).

Results and Discussion

Significant differences were observed in dry matter digestibility. The digestibility coefficient was by 15.59% higher in group I than in group II. Organic matter digestibility was also statistically highly significantly higher in the control group, compared with the experimental group. Crude protein utilization was 89.18 in group I, and 62.03% in group II. According to Sławoń (1987), crude protein digestibility at a level of 70% should be considered low, but within relevant norms for Arctic foxes. In one experiment conducted by Lorek et al. (1991) Arctic foxes used 64.6 to 76.0% crude protein. In another experiment by Lorek et al. (1994a) coefficients of crude protein digestibility were higher, i.e. 84 – 85%. In this study coefficients of crude fat digestibility were 97.40% and 89.54% in groups I and II respectively. The difference in protein utilization was statistically highly significant and amounted to 7.86%. The high level of crude fat utilization recorded in group I resulted from a high content of poultry confiscates in the diet. As reported by Sławoń (1987), due to its chemical composition poultry fat belongs to easily digestible animal fats. Crude fat digestibility was lower in the experimental diet, whose main component was meat-bone meal. A similar relationship was obtained by Sławoń (1981), in whose experiment foxes were fed dried roughage containing animal meals. The coefficient of crude fiber digestibility was similar in both groups. It should be noted that utilization of carbohydrates, especially crude fiber, is generally worse in foxes. Crude fiber digestibility is not of primary importance in fox nutrition, due to its low content of the ration. The digestibility of N-free extractives was also similar in both feeding groups (82 – 86%), and its level can be considered satisfactory. In a study carried out by Gugołek et al. (1997), the digestibility of N-free extractives was 65 to 66%. The results of the present experiment show that gross energy utilization was better in the animals fed a traditional diet, which resulted from high digestibility of crude protein and crude fat in this group. The difference between the control and experimental group was statistically highly significant – 15.17%.

Nitrogen retention in relation to nitrogen taken was 23.77% in the control group, and 18.87% in the experimental group. Nitrogen retention in relation to nitrogen digested was 26.62% and 30.06% respectively. The effect of experimental feeding on nitrogen retention could not be determined due to the lack of statistical differences in this parameter between the groups. In a study conducted by Lorek et al. (1994b) nitrogen retention in relation to nitrogen taken was 23.69% and 37.65%, and nitrogen retention in relation to nitrogen digested

– 29.62% and 44.35% respectively.

Table 1
Coefficients of nutrient and energy digestibility, and nitrogen retention (%)

Specification	Statistical measures	Group	
		I	II
Dry matter	n	4	4
	x	86,63^{xx}	71,04^{xx}
	v	1,68	6,22
Organic matter	x	89,44^{xx}	75,96^{xx}
	v	1,48	5,71
Crude protein	x	89,18^{xx}	62,03^{xx}
	v	2,47	10,07
Crude fat	x	97,40^{xx}	89,54^{xx}
	v	0,74	1,96
Crude fiber	x	20,04	19,68
	v	3,41	3,87
N-free extractives	x	85,93	82,06
	v	1,00	5,99
Gross energy	x	91,14^{xx}	75,97^{xx}
	v	1,06	4,88
N retention/N uptake (%)	x	23,77	18,87
	v	21,74	30,88
N retention/ N digested (%)	x	26,62	30,06
	v	20,67	25,67

x - P≤ 0.05, xx - P≤ 0.01

Conclusions

1. The diet containing animal meal and extruded ground grain was characterized by statistically lower digestibility of dry matter and organic matter, except for crude fiber and N-free extractives.

2. The experimental diet caused a statistically significant decrease in gross energy digestibility.

3. Nitrogen retention was similar in both groups, and the differences were statistically non-significant.

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ВЛИЯНИЕ ДИФФЕРЕНЦИРОВАННОГО ВВЕДЕНИЯ ПОДСОЛНЕЧНИКОВОГО ЖМЫХА И ЭНЗИМНЫХ ПРЕПАРАТОВ В РАЦИОНЫ ПРИ ОТКОРМЕ СВИНЕЙ

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Подсолнечный жмых характеризуется высоким уровнем общего белка (15–45%) и эфирного экстракта (3,5–38%). Недостаток лизина в белке подсолнечника, высокое содержание сырой клетчатки (11–25%) в получаемых продуктах (несмотря на лущение семян) ограничивает его использование (San Juan и Villamide 2000). Содержание сырого жира с хорошим составом жировых кислот влияет диетические и энергетические качества оцениваемого корма. Доля семян или подсолнечного жмыха свыше 5% в составе смеси вызывает у подрастающих свиней уменьшение средних суточных приростов массы тела и ухудшение использования корма (Courboulay V., Massabie P. 1994 а также Lipiński, K.,Tywończuk, J., 1998). Dierick и Decuypere (1996), Albar и соавт. 2000) указывают возможность заменения в смесях для свиней белка сои или злаков белком семян масличных растений при условии дополнения их синтетическими аминокислотами и экзогенными ферментами.

Целью работы было установить возможность частичной замены послеэкстракционной соевой дерти подсолнечным жмыхом в смесях для молодняка. Кроме того, анализировали возможность увеличения пригодности подсолнечного жмыха в результате применения кормовых ферментов.

Опытом было охвачено 190 голов откормочников (кб х л) разделеных на 4 группы. Начальная живая масса состовляла около 35 кг. Применяли полнорационные смеси РТ-1 и РТ-2 (первый и второй период откорма) (табл. 1). В рационах контрольной группывместе со злаковыми (пшеница и ячмень) в качестве высокобелкового компонента использована послеэкстракционная соевая дерть. В опытных рационах часть послеэкстракционной соевой дерти заменили подсолнечным жмыхом в количестве 10% (смесь II) и 15% (смесь III и IV). В рационе IV группы применили энзиматические препараты Energex и Bio Feed Wheat в количестве 0.025% и 0.035%.

Результаты опытов на откормках обработали статистически методом однофакторного анализа вариантов, в орфогональной системе.